

CLAIMS

What is claimed is:

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- 5
1. A custom made battery for use in a hearing aid insertable into an ear canal, the battery being shaped to substantially conform to a portion of the ear canal between the aperture and the first bend.
2. The battery of Claim 1, wherein the battery is tapered.
3. The battery of Claim 1, wherein the battery includes at least one step.
4. The battery of Claim 1, wherein the hearing aid is disposable.
5. The battery of Claim 1, wherein the hearing aid is nondisposable.
- 10 6. The battery of Claim 1, wherein the battery includes an elliptical cross-section.
7. The battery of Claim 1, wherein the battery is metal.
8. The battery of Claim 1, wherein the battery is plastic.
- 15 9. A hearing aid insertable into an ear canal, comprising:
a microphone which translates acoustic energy into electrical signals;
signal processing circuitry which processes the electrical signals provided by the microphone;
a receiver which converts the processed electrical signals into acoustic energy; and

a power source connectable to the signal processing circuitry, the power source being shaped to substantially conform to a portion of the ear canal between the aperture and the first bend.

10. The hearing aid of Claim 9, further comprising a housing formed of two half-shells joined together and enclosing one or more of the microphone, the signal processing circuitry, and the receiver.
11. The hearing aid of Claim 9, wherein the power source is disposed between the microphone and the receiver to prevent feedback between the same.
12. The hearing aid of Claim 9, further comprising a flexible circuit interconnecting the power source and receiver.
13. The hearing aid of Claim 9, wherein the power source is tapered.
14. The hearing aid of Claim 9, wherein the power source includes at least one step.
15. The hearing aid of Claim 9, wherein the hearing aid is disposable.
16. The hearing aid of Claim 9, wherein the hearing aid is nondisposable.
17. The hearing aid of Claim 9, wherein the power source is formed with an elliptical cross-section.
18. The hearing aid of Claim 9, wherein the power source is a metal battery.
19. The hearing aid of Claim 9, wherein the power source housing is formed of a plastic material.

20. A method for forming a custom made battery for use in a hearing aid insertable into an ear canal, comprising shaping the battery to substantially conform a portion of the ear canal between the aperture and the first bend.
21. A battery for use in a hearing aid, comprising:
5 a plastic housing partially surrounding a metal shell, the metal shell being expandable and containing zinc and electrolyte;
a plastic cathode plate sealing one end of the metal shell; and
a cathode grid proximate the plastic cathode plate.
22. The battery of Claim 21, further comprising at least one cathode electrode and at
10 least one anode electrode disposed in the cathode plate.
23. The battery of Claim 21, wherein the hearing aid is insertable into an ear canal and the plastic housing is shaped to substantially conform to a portion of the ear canal between the aperture and the first bend.
24. The battery of Claim 23, wherein the plastic housing is tapered.
- 15 25. The battery of Claim 23, wherein the plastic housing includes at least one step.
26. The battery of Claim 21, wherein the hearing aid is disposable.
27. The battery of Claim 21, wherein the hearing aid is nondisposable.
28. The battery of Claim 21, wherein the plastic housing includes an elliptical cross-section.
- 20 29. A hearing aid, comprising:

a microphone which translates acoustic energy into electrical signals;
signal processing circuitry which processes the electrical signals
provided by the microphone;

5 a plastic housing partially surrounding a metal shell, the metal shell
being expandable and containing zinc and electrolyte;

a plastic cathode plate sealing one end of the metal shell;

a cathode grid proximate the cathode plate;

a cathode electrode disposed in the cathode plate to interconnect the
cathode grid and the signal processing circuitry;

10 an anode electrode disposed in the cathode plate to interconnect the
metal shell and the signal processing circuitry;

a receiver which converts the processed electrical signals into acoustic
energy; and

a connector that connects the signal processing circuitry to the receiver.

15 (30) A battery for use in a hearing aid, comprising:

a plastic housing containing zinc and electrolyte;

a plastic cathode plate sealing one end of the plastic housing to contain
the zinc and electrolyte in the plastic housing; and

a cathode grid proximate the plastic cathode plate.

20 (31) A hearing aid, comprising:

a microphone which translates acoustic energy into electrical signals;
signal processing circuitry which processes the electrical signals
provided by the microphone;

a plastic housing containing zinc and electrolyte;

25 a plastic cathode plate sealing one end of the plastic housing to contain
the zinc and electrolyte in the plastic housing;

a cathode grid proximate the cathode plate;

a cathode electrode disposed in the cathode plate to interconnect the cathode grid and the signal processing circuitry;

an anode electrode disposed in the cathode plate and passing into the zinc and electrolyte and contacting the signal processing circuitry;

5 a receiver which converts the processing electrical signals into acoustic energy; and

a connector that connects the signals processing circuitry to the receiver.

32. A method for automatically shutting down a hearing aid, comprising:

10 calculating the total time the hearing aid is turned on excluding the time the hearing aid is turned off; and

shutting down the hearing aid upon reaching a predetermined amount of total time the hearing aid is turned on.

33. The method of Claim 32, further comprising warning the user prior to shut down of the hearing aid.

15 34. The method of Claim 32, wherein the step of shutting down the hearing aid includes disconnecting a receiver of the hearing aid.

35. A hearing aid, comprising:

20 a microphone which translates acoustic energy into electrical signals; signal processing circuitry which processes the electrical signals provided by the microphone;

a receiver which converts the processing electrical signals into acoustic energy;

a counter which calculates the total time the hearing aid is turned on, excluding the time the hearing aid is turned off; and

a shut down device to disable the hearing aid upon reaching a predetermined amount of total time the hearing aid is turned on.

36. An automatic shut down apparatus for a hearing aid, comprising:

5 a counter which calculates the total time the hearing aid is turned on, excluding the time the hearing aid is turned off; and

a shut down device to disable the hearing aid upon reaching a predetermined amount of total time the hearing aid is turned on.

37. The apparatus of Claim 36, further comprising a warning device to warn the user prior to shut down of the hearing aid.

10 38. The apparatus of Claim 36, wherein the shut down device disconnects a receiver of the hearing aid.

39. The apparatus of Claim 36, wherein the counter uses nonvolatile memory.

(40) A method for automatically shutting down a hearing aid, comprising:

15 calculating a continuous amount of time starting from when the hearing aid is turned on; and

shutting down the hearing aid upon reaching a predetermined amount of time.

(41) A method for automatically shutting down a hearing aid, comprising:

20 programming electronics of the hearing aid such that the hearing aid will operate only during a predetermined time interval; and

activating the hearing aid by turning it on during the predetermined time interval.

42. A circuit in a hearing aid that shuts down a hearing aid after a predetermined amount of time has elapsed.
43. The circuit of Claim 42, wherein the elapsed time is the total time the hearing aid is turned on, excluding the time the hearing aid is turned off.
- 5 44. The circuit of Claim 42, wherein the elapsed time is the total time since the hearing aid is turned on.
45. A hearing aid having a generally oval cross-sectional base portion, an elongate curved middle portion, and a mushroom-shaped tip portion.
46. The hearing aid of Claim 45, in which a battery is provided having a stepped shape to conform to the interior of the hearing aid.
- 10 47. The hearing aid of Claim 45, wherein the oval varies in size progressing toward the middle portion.
48. A hearing aid insertable into an ear canal, comprising:
a microphone which translates acoustic energy into electrical signals;
15 signal processing circuitry which processes the electrical signals provided by the microphone;
a receiver which converts the processed electrical signals into acoustic energy;
a power source connectable to the signal processing circuitry; and
20 a shell enclosing one or more of the microphone, the signal processing circuitry, and the receiver, the shell including a substantially transparent faceplate which is externally visible after the hearing aid is inserted into the ear canal.

49. The hearing aid of Claim 48, wherein the faceplate is tinted.

50. The hearing aid of Claim 48, wherein the faceplate is flesh colored.

51.

A hearing aid insertable into an ear canal, comprising:

a microphone which translates acoustic energy into electrical signals;

5 signal processing circuitry which processes the electrical signals
provided by the microphone;

a receiver which converts the processed electrical signals into acoustic
energy;

a power source connectable to the signal processing circuitry; and

10 a shell enclosing one or more of the microphone, the signal processing
circuitry, and the receiver, the shell including a substantially translucent
faceplate which is externally visible after the hearing aid is inserted into the ear
canal.

52. The hearing aid of Claim 51, wherein the faceplate is tinted.

15 53. The hearing aid of Claim 51, wherein the faceplate is flesh colored.

54.

A hearing aid insertable into an ear canal, comprising:

a microphone which translates acoustic energy into electrical signals;

signal processing circuitry which processes the electrical signals
provided by the microphone;

20 a receiver which converts the processed electrical signals into acoustic
energy;

a power source connectable to the signal processing circuitry; and

a shell enclosing one or more of the microphone, the signal processing
circuitry, and the receiver, the shell including a faceplate which is externally

visible after the hearing aid is inserted into the ear canal, the faceplate including a reflective surface.

55. The hearing aid of Claim 54, wherein the faceplate is formed with compound curves.

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(56.)

A hearing aid insertable into an ear canal, comprising:

a microphone which translates acoustic energy into electrical signals;
signal processing circuitry which processes the electrical signals

provided by the microphone;

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a receiver which converts the processed electrical signals into acoustic energy;

a power source connectable to the signal processing circuitry; and

a coupling mechanism that simultaneously electrically connects the
signal processing circuitry, the receiver, and the power source, the coupling
mechanism including contact members.

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57. The hearing aid of Claim 56, wherein the contact members include leaf springs having twisted ends for ensuring an electrical connection.

(58.)

A method of assembling a hearing aid, comprising:

installing a microphone which translates acoustic energy into electrical
signals, signal processing circuitry which processes the electrical signals
provided by the microphone, a receiver which converts the processed electrical
signals into acoustic energy, and a power source connectable to the signal
processing circuitry into a first half-shell;

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electrically connecting the signal processing circuitry, the receiver, and
the power source with a single coupling mechanism; and

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permanently attaching a second half-shell to the first half-shell to form a disposable hearing aid.

59.

A hearing aid insertable into an ear canal, comprising:

a microphone which translates acoustic energy into electrical signals;

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signal processing circuitry which processes the electrical signals provided by the microphone;

a receiver which converts the processed electrical signals into acoustic energy;

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a power source connectable to the signal processing circuitry; and

a switch mechanism that turns the hearing aid on upon insertion of the hearing aid into the ear canal and turns the hearing aid off upon removal of the hearing aid from the ear canal.

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The hearing aid of Claim 59, wherein the switch mechanism includes a pull cord connected to an insulating member, the insulating member breaking a circuit between the power source and the signal processing circuitry to turn the hearing aid off.

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61.

A method of turning on and off a hearing aid insertable into an ear canal, comprising:

pushing a cord attached to the hearing aid to insert the hearing aid into the ear canal and to turn the hearing aid on; and

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pulling the cord to extract the hearing aid from the ear canal and to turn the hearing aid off.

62.

A hearing aid, comprising:

a microphone which translates acoustic energy into electrical signals;

signal processing circuitry which processes the electrical signals provided by the microphone;

a receiver which converts the processed electrical signals into acoustic energy;

5 a first power source and a second power source connectable to the signal processing circuitry; and

a switch mechanism that selects and activates the first power source or the second power source.

63. The hearing aid of Claim 62, wherein the switch mechanism includes an
10 insulating member which, in an off position, covers a hole of each power source to prevent air from entering into each power source, the switch mechanism further including a conducting member for connecting, in the on position, the first power source or the second power source to the signal processing circuitry, the switch mechanism further including an aperture therethrough for allowing an
15 air pathway for allowing air to enter the selected power source to activate the same.

(64.) A method for turning a hearing aid on, comprising:
selecting, from at least two power sources of the hearing aid, a power
source to power the hearing aid;
20 connecting the selected power source to electronics of the hearing aid;
and
activating the selected power source.

(65.) Packaging for a hearing aid, the hearing aid including a switch for turning the
hearing aid on and off, comprising a housing having a groove that substantially
25 conforms to at least a portion of the shape of the hearing aid to snugly hold the hearing aid, the groove being substantially open adjacent the switch.

66. The packaging of Claim 65, further comprising a securing member to immobilize the switch relative to the housing.

67.

A method of packaging a hearing aid, comprising:

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forming a housing having a groove that substantially conforms to at least a portion of the shape of the hearing aid to snugly hold the hearing aid, the groove being substantially open at at least one end; and

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positioning the hearing aid within the groove such that a switch of the hearing aid that turns the hearing aid on and off is positioned within the open end of the groove.

68. The method of Claim 67, further comprising immobilizing the switch relative to the housing.